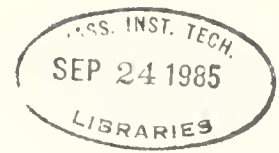


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A STRUCTURAL EQUATION MODEL OF SCANNING BEHAVIOR OF
MANAGERS

Professor Sumantra Ghoshal
Sloan School of Management

August, 1985

W.P. #1696-85

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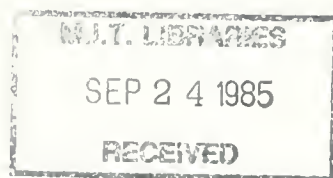
/ A STRUCTURAL EQUATION MODEL OF SCANNING BEHAVIOR
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SECTION 1 :INTRODUCTION

One of the major ongoing debates in the fields of both Business Policy and Organization Theory is between what can be called the "rational-analytical" and the "emergent-incremental" models of strategy formulation and organizational change. Historically the two sides to the debate have followed non-intersecting parallel paths. In the strategy literature, proponents of the rational-analytical view have based their arguments on normative models of how purposeful organizations (or leaders) should behave. They have claimed that organizations can proactively adapt through managerial actions of creating and changing organizational purpose (Barnard, 1938; Selznick, 1957; Andrews, 1971), through analytical planning systems (Ansoff, 1965; Ackoff, 1970), and through modifications in their structures and processes (Chandler, 1962). Supporters of the emergent-incremental view, in contrast, have depended on deductions from empirical observations. They (e.g., Pettigrew, 1973; Quinn, 1980) have shown that in actual practice organizations do not follow the "rational" process assumed in the normative models. Strategic freedom of Organizations are constrained by both external and internal limitations and strategy formulation, according to the adaptive view, is an incremental process of navigating along the corridors of indifference ; of bargaining and coalition building that become manifest as a stream of disjointed decisions. Thus, they have rejected the rational-analytical view, labeling it as a "heroic view of management" that is both unreal and unrealizable. Believers of strategic planning, in turn, have repudiated the incrementalist view as neither accurate nor useful. A recent rebuttal from Andrews is typical :

"There is something to be said, I must admit, for the owlish adherents to the primacy of incrementalism and administrative process. Repelled by the best and brightest analysts, they assert the wisdom of the practitioner and believe that an organization, properly nurtured, can lay out like a snail the path of its own progress. So it can, but the path is visible only behind the snail. Those who believe that life is too uncertain to permit planning and that purpose must remain mostly intuitive, are a kind of Greek chorus, keeping the rest of us honest while they hymn their classic cop-out." (Andrews, 1983, p3).

In the field of organization theory, similar differences in perspective about the role of strategy is manifest from the diversity of views that range from, on one extreme, the strategic choice argument of Child (1972) and, on the other, the population ecology model proposed by authors such as Aldrich (1979) and Hannan and Freeman (1977). In fact, as argued by Astley and Van de Ven (1983) and Pfeffer (1982), the perspective on action or the assumptions regarding deterministic, voluntaristic or emergent nature of decision-making and choice is a critical dimension that distinguish among different theoretical positions on the nature of organizations.

Only recently a conceptual synthesis is emerging out of this debate through the work of authors such as Mintzberg (1978), Burgelman (1983), and Lawrence and Dyer (1983). They have proposed different versions of what can be called a contingency view of strategy. In essence they argue that the nature of the organizational adaptation process and the extent of strategic freedom enjoyed by a firm depends on the nature of its environment and the characteristics of its own organization (Lawrence and Dyer, 1983). The realized strategy of a firm has both a deliberate and an emergent component (Mintzberg, 1978); a part that is induced by the current structural context and a part that is autonomous, arising from managerial entrepreneurship (Burgelman, 1983). There is evidence that this eclectic and contingent view of strategy is receiving increasing

theoretical and empirical attention in the literature on management and organization theory (see Burgelman, 1985 for a review).

This view of strategy, however, begs an important question. There is sufficient empirical literature that documents the increasing use of formal planning systems in large corporations. In their recently concluded three-year, multiphased study involving over 500 of the world's largest corporations, Klein and Linneman (1984) have shown that over 90% of such companies have fairly extensive systems for long term planning and that most of these systems are at least designed to achieve the "rationality" implied in the normative models. Yet, as Burgelman argues, the output of the system is not fully "autonomous". The question then becomes this : how does "induced" strategy emerge out of the process of "rational" formal planning that most modern firms adopt ? In other words, what is the process through which, in the planning mechanism, the current strategy or structure of the firm affects its future strategy ?

Bower (1970) had provided one answer to this question - an answer that focussed on the internal process through which problems are defined, alternative proposals are initiated and, finally, one of the proposals receives the "impetus" that leads to its acceptance. Internal structure, in the process model of Bower, affects strategy by influencing these sub-processes of definition, initiation and impetus.

Environmental scanning can be another mechanism through which current strategy, despite an intendedly rational planning process, can circumscribe future strategy. Scanning is assumed to provide the external intelligence that is the starting point for all normative strategic planning models. If, however, the current situation of the firm determines what

aspect of the environment will be paid attention to and how the attended sectors will be perceived (i.e., the enactment process described by Weick, 1969), then even if the actual strategy making process follows the normative models, the output may be incremental or, in Burgelman's terms, display induced strategic behavior.

If scanning is entirely limited to what Dill (1958) called the "task environment" and Thompson (1967) called the "domain", the information base on which future strategy will be based is limited to the current activities of the organization. Such scanning cannot lead to ventures in new fields - to "autonomous strategy" as defined by Burgelman. For autonomous strategy to emerge, the planning process must have an information input that is not entirely limited by current understanding of what the firm's domain is ; i.e., a part of scanning must look beyond the task environment to the broader "general environment".

Therefore, an interesting issue in studying scanning behavior is the extent to which scanning is either limited to the current environment (referred subsequently in this paper as "focus"), or extends beyond it ("breadth"). An analysis of the factors that influence focus or breadth in scanning behavior of managers can, following the preceding line of argument, provide interesting insights into the strategy formation processes of firms. Such insights can have useful implications for both theory and practice.

This paper reports the findings of such an analysis. In the following section, the concepts of focus and breadth in individual level scanning behavior are developed and operationalized so as to be measurable. In sections 3 and 4, drawing from a diverse stream of literature, a model is proposed for explaining the differences in this aspect of scanning. In

section 5, the methodology and data used for testing and refining the model are explained, and the findings are presented in section 6. The data supports many of the theory derived hypotheses, but also yields some results that are contradictory to expectations.

Limitations of sampling, data, and data analysis constrain the generalizability of the results. However, the findings do provide the basis for a number of interesting conjectures. These implications are discussed in the seventh and concluding section of the paper.

Issues of sampling and measurement are briefly discussed in the Appendix.

SECTION 2 : OPERATIONALIZING SCANNING BEHAVIOR

The concept of a "domain", as developed by Thompson (1967) is based on the notion of the "task-environment" suggested by Dill (1958) as those parts of the broader environment which are relevant to the setting and attainment of goals. Specifically, Dill suggested that the task environment consists of customers, suppliers, competitors and regulatory groups. These, according to Thompson, constitute the membership of the firm's domain. A concept quite similar to that of the domain is the notion of "organization-set" developed by Evan (1966). Defining members of a focal organization's organization-set is a subjective task and "there may be as many organization-sets as there are different statuses for an organization to occupy" (Aldrich and Whetten, 1981). However, generally, the important members of the set are those who are members of the organization's task-domain for ultimately both the concepts are tied together through the notion of goals -

membership of both are determined by the actors who can affect the organization's attainment of goals (Caplow, 1964).

Following these arguments, focussed or domain-constrained scanning can be defined as scanning for information related to the current task-environment and obtained through other members of the domain. In other words, acquiring information about market, competition and technology through customers, suppliers and agents and distributors characterize domain-focussed scanning behavior. In contrast, obtaining information about general regulatory, social, political, economic or resource-related issues through publications, consultants, advertising agents etc. characterizes what may be called broad or unconstrained scanning. Such a scheme for categorizing scanning behavior is shown in Figure 1. Note that the division between the two types of scanning behavior is fuzzy and the distinction is made primarily in terms of what is the principal component of the manager's scanning activity.

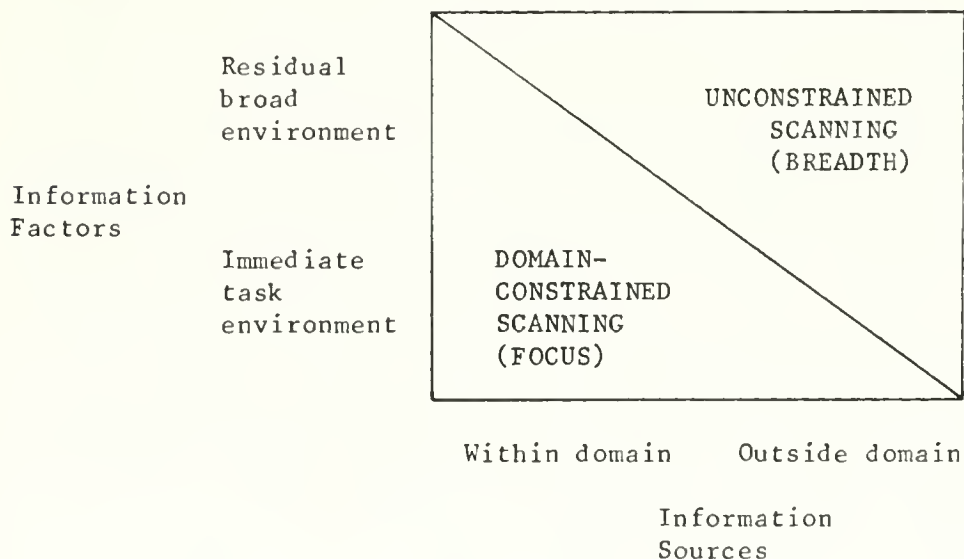


Figure 1 : Categorization of scanning behavior

SECTION 3 : THE INFLUENCING VARIABLES

A starting premise of the research reported in this paper was that scanning behavior of individuals may be affected by a host of individual, organizational and environmental attributes. Previous studies on scanning have already suggested some of these influencing variables. Research in the fields of cognitive psychology, business policy and organization behavior suggest a number of others that have so far not been considered in scanning studies.

The individual characteristics included in the study as possible influencers of scanning behavior of managers are their positions in the management hierarchy, their experience with diversity, and their entrepreneurial orientation (there is no assumption of the attributes being independent).

Aguilar (1967), Collings (1968), Keegan (1967), Kefalas and Schoderbeck (1973) and Hambrick (1982), among others, have demonstrated the influence of management level on individual scanning behavior. The possibility that the past background of managers, and, particularly, their exposure to diversity may affect scanning behavior is derived from the suggestions and findings of Hogarth (1980), Schroeder, Driver and Strenfert (1968), and Keen (1973). Wide experience with diversity can enhance an individual's cognitive complexity thus improving her ability to comprehend and integrate diverse pieces of information and to tolerate and deal with ambiguity. The possibility of the individual's entrepreneurial orientation affecting the way scanning is carried out arises out of the arguments of Stevenson (1983) and other researchers on entrepreneurial behavior.

While individual behavior is affected by these individual attributes, it is also shaped by context - by the

characteristics of the environment, the nature of managerial tasks, and the orientation of the organization. Managers dealing with non-complex environments may have fewer critically important information categories required for decision making. They may not require complex scanning systems. On the other hand, organizations facing complex environments may need extensive scanning of individual or clusters of sectors in the environment. Theoretically, these arguments follow from proposals of Thompson (1967) and Galbraith (1977). Empirically, the findings of Fahey and King (1975) and Kefalas and Schoderbek (1973) provide at least limited supporting evidence.

The expectation of a link between task characteristics and scanning behavior of managers arises from the empirical evidence that nature of the task represents one source of variation in managerial information processing requirements (Bavelas, 1950; Becker and Baloff, 1969; Tushman, 1979). When tasks are non-routine or highly complex, participants face high uncertainty and therefore need greater amounts of information for uncertainty reduction and effective performance (Tushman and Nadler, 1978; Van de Ven and Ferry, 1980). Scanning is one of the mechanisms available to managers for meeting information needs and it can, therefore, be expected that the nature of scanning would depend on the nature of tasks that a manager has to carry out.

The effect of a firm's strategy on its scanning system and on the scanning behavior of its managers have been proposed and tested by Hambrick (1982). Put simply, the more analytically a firm is oriented, the more extensive is its scanning system expected to be since scanning provides an input for carrying out such analysis. A prospecting firm (Miles and Snow, 1978), in contrast, may depend more on experimentation and trial and error and may show lesser scanning intensity.

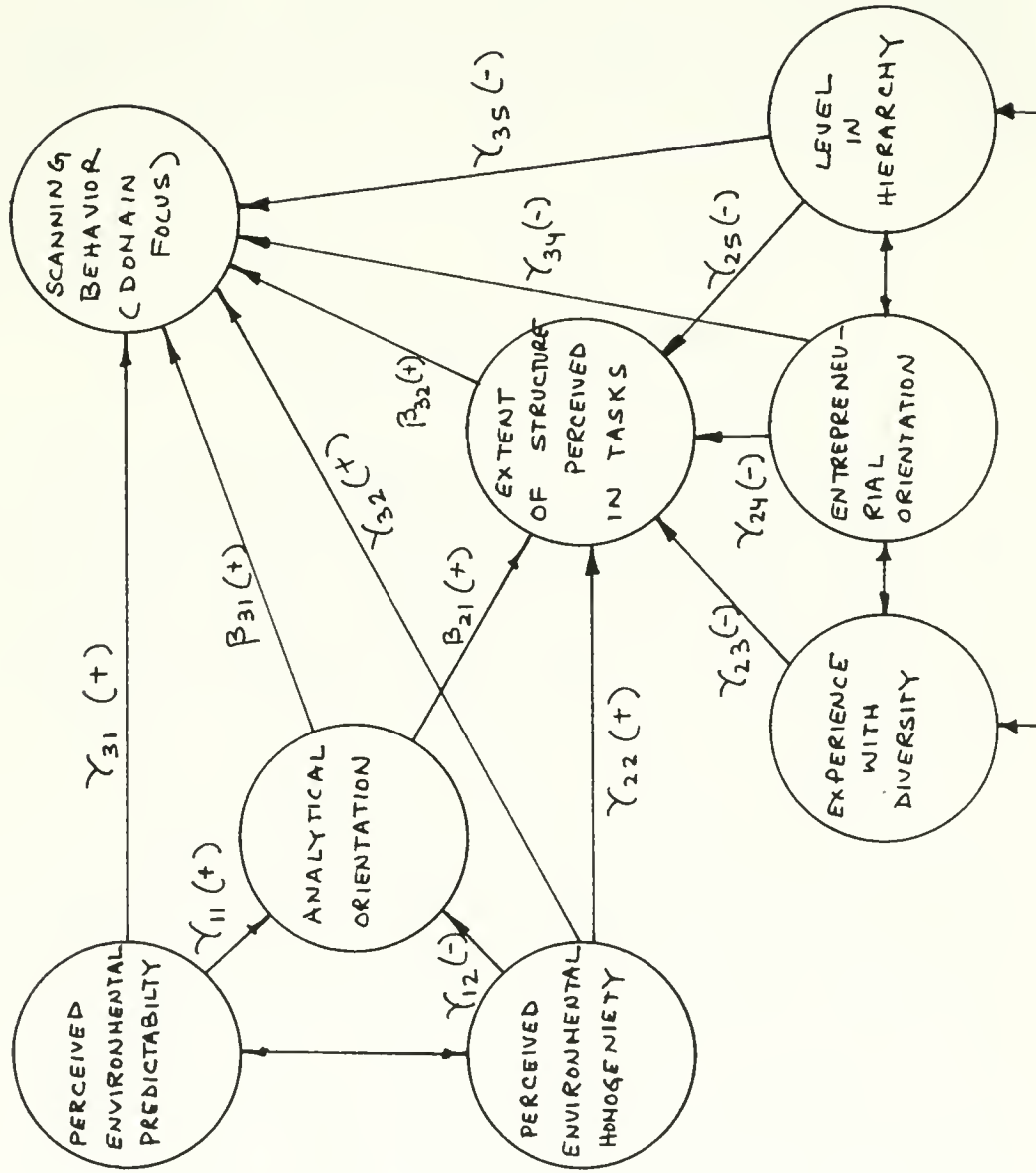
These are the influencing variables that are included in the model. This is not an exhaustive list and there may be a number of other factors that can affect how managers scan their environments (see Ghoshal, 1984 for a detailed discussion of such variables). In the final analysis, choice of these and not the other variables for inclusion in the framework is a subjective decision based on best judgement keeping in view the conflicting demands of parsimony and completeness.

SECTION 4 :MODEL AND HYPOTHESES

Figure 2 is the diagrammatic representation of a model that attempts to explain variations in breadth and focus of individual level scanning as due to direct and mediated influences of the different factors discussed in the preceding section. The hypotheses underlying the model are discussed below.

The more unpredictable the environment is perceived to be, the more does a manager feel the need to monitor a diverse range of issues. In a predictable environment, there is a linearity - a continuity - and the continuity often arises from a relative stability in the task environment. When there is such a stability, say, due to the existence of a stable oligopoly, there is usually an effective signalling system within the domain and it suffices if these signals are monitored and responded to. In other words, in a predictable environment, the needs of external intelligence may be served by monitoring existing members of the domain. In an unpredictable environment, in contrast, the cause of uncertainty may lie in the instability of the domain itself and a broader range of environmental actors and issues may need to be monitored to cope with such uncertainty. Hence, it can be hypothesized that :

FIGURE 2 : PROPOSED MODEL OF INDIVIDUAL LEVEL SCANNING BEHAVIOR



Note : Parameters labeled as per Bagozzi (1983). Hypothesized signs of parameters indicated in the diagram.

H1 : When the environment is perceived as predictable, managerial scanning will be focussed. When the environment is perceived as unpredictable, scanning will be relatively broad and unconstrained.

Environmental analysis is a response to environmental uncertainties. An integral argument of the information processing view of organizations is that more the perceived uncertainty in the environment, more will be the need for managers to develop an analytical orientation. Hence, in the model, analytical orientation of managerial processes is considered as an endogenous variable. However, perceptions of environmental predictability and environmental homogeneity are expected to affect the need for analysis differently. As argued by Daft and Weick (1984), when the environment is seen as unpredictable, experimentation rather than analysis is used by managers to cope with uncertainty. An environment is perceived as unpredictable because either the causal relations between actions and outcomes are unknown or because there exists discontinuities that cannot be anticipated. Under such circumstances, analysis is of limited value. This inverse relationship between environmental unpredictability and analysis has been noted by Kobrin et al (1980), Boulton et al (1982) and Keegan (1974). In contrast, when the environment is heterogeneous, the need for analysis goes up since a large number of actors and issues need to be monitored. This leads to the hypotheses :

H2 : In an unpredictable environment, managers will be less analytically oriented.

H3 : When the environment is perceived as heterogeneous, managers will be more analytical in their approach.

Further, a heterogeneous environment results in very large organizational networks (Aldrich and Whetten, 1981) and it becomes increasingly difficult to either define a domain parsimoniously enough for the term to have any

practical connotation or to limit scanning attention to any specified set of actors to which the firm is directly linked. At the limit, in the case of extreme heterogeneity of the environment, the entire environment becomes a part of the firm's task environment. Thus, as the environment is perceived to be more and more heterogeneous, scanning has to become broad, involving more and more environmental actors. In other words,

H4 : In a heterogeneous environment, scanning will be relatively broad and unconstrained.

Greater the heterogeneity of the environment, greater is the amount of information that has to be processed by the manager to cope with environmental uncertainty. Also, as shown by Daft and Macintosh (1981), the amount of environmental information processed by managers is positively associated with their perception of task variety. This finding can be extended to suggest that when managers perceive their environment to be heterogeneous, they also perceive their tasks to be unstructured. This is plausible for the multiplicity of issues that need to be considered for effective task performance (the cause of environmental heterogeneity) is an essential feature of an unstructured task (Perrow, 1967). Therefore,

H5 : When the environment is perceived to be heterogeneous, managers perceive their tasks to be relatively unstructured.

A strong emphasis on analysis is usually associated with management's commitment to the firm's current domain. Analysis is useful when there is some understanding of the causal effect of events on outcomes. The further away one goes from the immediate task environment, the more difficult it becomes to discern such causal implications. Experimentation and risk-taking rather than analysis are the characteristics of

managers who look for opportunities in the broader environment. Managers with high analytical orientation focus their scanning within the task environment since it is only such domain-constrained information that is amenable to formal analysis. Or,

H6 : More analytically oriented managers are also more focussed in their scanning attention.

Experience with diversity enrich the cognitive script of managers (Abelson, 1976) and enhance their capacities to deal with ambiguities. Managers more exposed to diversity feel less compelled to limit the perceptions of ambiguity and equivocality in their tasks (Daft and Macintosh, 1981; Kiesler and Sproull, 1982). They are more willing and able to see the ill-structured aspects of their tasks and to acknowledge rather than ignore the multiplicity of issues and influences that must be considered in managerial judgement and decision-making. Therefore,

H7 : Greater the managers' experiences with diversity, the more they will recognize the unstructured aspects of their tasks.

Following Stevenson (1983), an individual's strategic orientation can be categorized as entrepreneurial or trustee-like. Trustees have the characteristics of bureaucrats; they attempt to find standard operating procedures and rules and they see their tasks as relatively structured. They ignore those aspects of the job that are ill-structured and not amenable to standardization or formalization. They avoid complexity and ambiguity. Their schemas do not require them to explore the equivocal and often weak cues from the broader environment. Entrepreneurs, in contrast, typically explore the broad environment for opportunities and are more willing to acknowledge the ill-structured aspects of their managerial tasks. Two hypotheses follow :

H8 : More entrepreneurial managers perceive their tasks to be relatively less structured compared to managers who are less entrepreneurial.

H9 : More entrepreneurial managers display relatively broader scanning behavior.

Information and, by extension, analysis act as symbols and as signals that guide managerial actions and perceptions (Feldman and March, 1981). The more analytical a manager, the more she creates an internal environment that suggests analysis to be the basis for decisions and actions. But, a typical characteristic of ill-structured tasks is that they are not amenable to formal (and quantitative) analysis because of the variety and ambiguity inherent in them. Therefore, managers who emphasize analysis are those who see their tasks as relatively more structured, or

H10: More analytically oriented managers perceive their tasks to be relatively more structured.

Higher the position a manager occupies in the organizational hierarchy, less is the extent of internal differentiation (Lawrence and Lorsch, 1967) and more unstructured are her tasks (Wellinsky, 1967). Compared to junior managers, decisions that a top manager has to take involve greater complexity and explicit or implicit consideration of a far diverse range of issues and influences. Top managers are more involved in long term decisions that are relatively more impacted by factors outside the current task environment of the firm. Hence,

H11: Higher up a manager in the organizational hierarchy, more unstructured her tasks are and appear to be.

H12: Higher the position a manager occupies in the organizational hierarchy, broader is her scanning.

Finally, the more unstructured managers see their tasks to be, the greater is the variety and diversity of information that they need to form the qualitative judgements that are essential to take decisions on unstructured problems. The whole notion of a domain becomes fuzzy since when the task is unstructured, it is difficult to identify the actors who can affect the outcome of a particular course of action. Therefore, a broader attention to the overall environment rather than focussed attention to a particular part of it characterizes the scanning behavior of managers who perceive their tasks to be highly unstructured. Hence the hypothesis:

H13 : The more unstructured a manager feels her tasks to be, the broader becomes her scanning.

SECTION 5 : TESTING AND REFINING THE MODEL

The model was tested and refined using data on scanning behavior of 111 managers in 16 large companies based in South Korea.¹ Sampling, data collection and measurement procedures are explained in the Appendix.

¹ In principle, the survey followed a nested design, with individual respondents belonging to different companies in two broad sectors (trading and manufacturing). However, one-way variance tests on all the measured variables indicated that sector or company level of analysis was not very useful since neither could explain a significant part of the variance for most of the variables. Hence, the responses were treated independently at the individual level of analysis. For a detailed discussion on the level of analysis, see Ghoshal (1985).

The general linear model developed by Joreskog and Sorbom (1982) was used for testing and refining the model. However, the small sample size, given the relatively large number of exogenous and endogenous variables, prevented testing of the measurement model and only allowed testing of the causal model.² Exploratory factor analysis of multiple indicators was used to obtain composite measures of what are essentially latent variables in the model. In effect, therefore, the latent variables were treated as if they were measured variables, thereby ignoring all measurement errors. However, separate and individual analysis of correlations among different indicators of each of the variables, as well as reliability coefficients of the composite measures indicated a satisfactory level of convergent validity of the measures (see Ghoshal, 1985 for details).

LISREL V, the computer program that supports the general linear model of Joreskog, offers a choice between the unweighted least squares and the maximum likelihood estimator methods for parameter estimation. The ML method depends on the assumption of multinomial normal distribution of the variables but has the advantage of readily providing

² To build the model using all the concerned measured variables (i.e., all different indicators of the eight latent variables) would require the inclusion of 32 variables and, following the arguments of Lawley and Maxwell (1971), a sample size of 111 rules out that option. Further, between two and three of the measured variables loaded significantly on the factors that, through the process of exploratory factor analysis, defined the measures of the latent variables. Thus, the sample size limitation prevented construction of even a simplified measurement model including only the most significant measured variables for each of the latent variables.

standard errors and t-statistics for the estimates. The ULS method does not assume any distribution for the variables, but does not generate either standard errors or t-statistics for the estimates nor an overall statistic for goodness of fit.

Given that most of the variables in the model are either ordinal or are computed by addition of variables measured on ordinal scales, ULS is clearly the theoretically superior method. However, the difference between ULS and ML estimates of the parameters are usually small and so, in the analysis, the ML method was used for model testing and refinement but the final model was also estimated on ULS.

Instead of simply testing the proposed model, the approach of an iterative process of model testing, modifying and retesting was adopted. The original hypotheses provided the starting point for the refinement process. Parameters whose estimates were small compared to their standard errors were eliminated and the resulting model was retested. The process of model refinement was guided by the analysis of normalized residuals of the variance-covariance matrix and legrange multipliers of the log likelihood function (what Joreskog and Sorbom call "modification indices").

The problem associated with this approach is that in the absence of appropriate control, the final model may be strongly influenced by chance sampling error in the data. One way to control for this possibility was to split the sample into two halves so that one half could be used for model building and the other half could be used to provide a clean test of the refined model (Bentler, 1980). In this case, however, the small sample size ruled out that possibility.

The only solution available was to adopt a tight control on model refinement so as to minimize the possibilities of capitalizing on chance. This was done by stopping the refinement process as soon as $p(\chi^2) > 0.10$ condition was reached. Saris, de Pijper, and Zegwaard (1979) have shown that this stopping criterion, originally proposed by Lawley and Maxwell (1971), is most likely to correct real specification errors in the model without overcorrecting the model for spurious sampling error (reference in Anderson, 1984, p31).

SECTION 5 : FINDINGS

The process of model modification and reconfirmation yielded parameter estimates shown in Table 1.

Before reviewing the parameter values, it is desirable to review the overall goodness-of-fit. The ULS run of the model yielded an adjusted goodness-of-fit index of 0.985 and an RMS residual of 0.036. The ML run yielded an adjusted goodness-of-fit measure of 0.973 and an RMS residual of 0.037. The total coefficient of determination for structural equations was 0.297 with ULS and 0.316 with ML. The ML estimation also showed a χ^2 of 5.57 (7 degrees of freedom). None of the variances were negative, no correlation coefficient was more than one. The correlations between the estimates were small, the largest being -0.297. The largest modification index was 2.18 - less than the value of 5.0 suggested by Joreskog and Sorbom (1982) as positive indicator for further model trimming. The normalized residual plot had a slope very near one compared to the 45° line (there was some skewness at the top).

PARAMETER	HYPOTHESIZED SIGN	ULS ESTIMATE	ML ESTIMATE	STANDARD ERROR	t VALUE
β_{31}	+ ve	0.095	0.096	0.095	1.003
β_{32}	+ ve	- 0.178	- 0.187	0.096	-1.936 ^{**}
γ_{11}	+ ve	0.420	0.450	0.087	5.163 ^{**}
γ_{22}	+ ve	0.211	0.183	0.097	1.884 [*]
γ_{23}	- ve	0.165	0.167	0.093	1.797 [*]
γ_{24}	- ve	-0.264	-0.258	0.097	-2.660 ^{**}
γ_{31}	+ ve	0.171	0.170	0.095	1.798 [*]
γ_{34}	- ve	- 0.136	- 0.151	0.098	-1.544
β_{21}	+ ve	Not significantly different from zero. Hypothesized association not confirmed.			
γ_{12}	- ve				
γ_{32}	+ ve				
γ_{25}	- ve	The variable X5 (Management Level) had no significant relationship and was dropped from the model.			
γ_{35}	- ve				

** significant at 0.05

* significant at 0.10

Table 1 : Parameter estimates and significance

The goodness-of-fit index in LISREL cannot be directly interpreted since it does not follow any known statistical distribution. All that can be said is that it sets an upper bound on the percentage of variance explained by the model (the coefficient of determination sets the lower bound). However, as per Walker and Weber (1984), the high measure of goodness-of-fit "suggests that a major portion of the variance in the data is explained by the model as a whole" (p18).

Figure 3 shows the path structure with the estimated parameters. The total effects of the different variables on scanning behavior are summarized in Table 2.

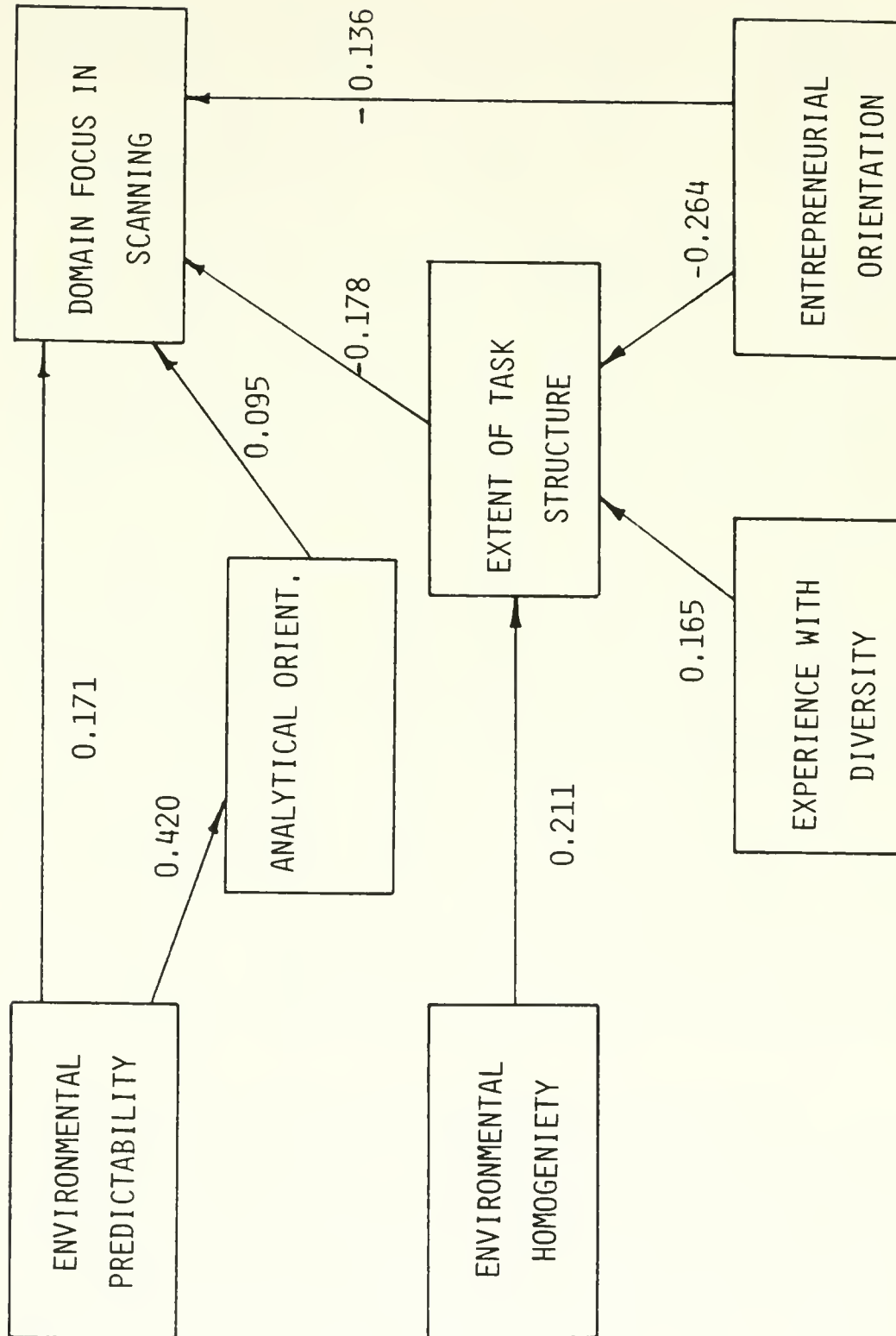
Total effect on individual
scanning behavior (extent of
domain focus)

Explanatory variables

1. Perceived environmental predictability	0.171
2. Perceived environmental homogeneity	- 0.078
3. Experience with diversity	- 0.029
4. entrepreneurial orientation	- 0.089
5. Analytical orientation	0.095
6. Perceived extent of structure in tasks	- 0.178

Table 2 : Total effect of influencing factors on
managerial scanning behavior

These findings must, however, be interpreted with caution because of the limitations in the data and methodology that constrain validity and generalizability of



CAUSAL PATH DIAGRAM

the results. First, there is the possibility of modeling error - after all the model explains anything between 32 (coefficient of determination) and 97 (adjusted goodness-of-fit) percent of the variance and there can be many alternative models that may fit the data equally well and that may either not reflect these relationships or may even show significant relationships the other way. One difficulty with structural equation models not often highlighted by users of the methodology is that a number of different models with very different path-structures and path-strengths may fit the data equally well and the only claim that can be made on behalf of a particular model is that it is superior to another model that shows a worse fit with the data. Not having such an alternative model (few users of this technique ever do), even that claim cannot be made for the final model developed in this study. Besides, the relationships may be spurious, arising out of measurement error or the process of model development. Finally, they may be an artifact of sampling, caused by non-random selection of respondents.

On the positive side, however, are the results of certain tests of internal and external validity that the data was subjected to. For want of space, it is not possible to discuss those tests in this paper (see Ghoshal, 1985 for details), but the broad outcomes deserve mention.

Concurrent validity of the data (Kidder, 1981) was tested by checking for certain intuitively obvious characteristics of scanning behavior of managers. For example, associations between functional specialization of managers and kinds of information they gather (R&D managers concentrate on technology, marketing managers on market conditions, and so on) and sources they use (finance managers use bankers, planners use publications, etc.) were all strong and of the right kind.

Factor analysis of the indicators, as well as simple correlation analysis generally supported construct validity of the variables and their operationalization. In most cases the variables and measures were those that have been successfully used by previous researchers, though in different environments and contexts.

Finally, the nature of scanning behavior of the sampled managers in terms of attributes such as kinds of information acquired, sources used, and scanning modes adopted were associated with a range of variables such as their professional and personal attributes as well as the attributes of their environments and tasks. The directions and strengths of these associations were largely consistent with the results of past surveys of scanning behavior of North American managers conducted by researchers such as Aguilar (1967), Keegan (1967), Collings (1968), Kefalas and Schoderbeck (1973), Hambrick (1982) and Miller and Friessen (1983). This provides some indirect (and weak) indication that the findings may be more generalizable than theoretical evaluation of the sample would allow.

SECTION 7 : DISCUSSION

Out of the six total effects, only those of perceived environmental predictability and perceptions regarding the nature of tasks are strong. The effects of perceived environmental homogeneity, analytical orientation, experience with diversity, and entrepreneurial orientation are weak. Four of these results are consistent with expectations and two are not.

In discussing these results, the weak (and possibly insignificant) effects are considered along with the strong ones, in the spirit that the most generous interpretation of the findings is that they suggest rather than prove a set of hypotheses. As indicated in the introductory section, the following discussion should be seen as grounded conjectures and not as analysis of cause for demonstrated effects.

When the environment is perceived as unpredictable, individuals scan a broader sector not limiting themselves only to their task domain. This link between environmental unpredictability and the need for broad scanning for "political and ideological intelligence" had been suggested by Wellinsky (1967) based on his sociological study of the organizational intelligence function. The same phenomenon was observed by Aguilar (1967) in his case studies. The association may have an important implication for organization design. As per the information processing view of organizations, perceived environmental unpredictability is influenced by the structure of the organization (see Daft and Macintosh, 1981 for a review). Therefore, at least to a limited extent, how unpredictable the managers of a firm feel the environment to be can be manipulated at the margin through organization design. This perception of unpredictability, in turn, would affect the nature of scanning and, in the long term, the adaptive capability of the firm.

Normatively, such an argument has been made before. For instance, It has been suggested by Lorange, Scott Morton and Ghoshal (forthcoming) that an organization needs to both protect its core (Thompson, 1967) and expose it for effective learning and adaptation. Exposure to the broad environment is useful in sensitizing the organization

(or a sub-unit) to the need for change ; protecting and isolating it is desirable in the process of effecting and institutionalizing the change. Thus, according to these authors, the structure of the organization or the sub-unit should vary depending on the particular phase of adaptation that it is going through. The present findings add credibility to this normative argument. An organization needs to be overintegrated at the sensitizing phase so that managers perceive the environment to be more unpredictable and broaden their scanning to the wider environment. At the change-embedding phase, it needs to be overdifferentiated so that members perceive the environment to be relatively more stable and can institutionalize the change while paying attention only to the more limited task environment.

A number of authors have recently pointed out the dangers of an overly analytical approach of companies that can curb innovation, experimentation and risk-taking. Peters and Waterman (1982) have spoken about the "bias for action" - of the need to follow the "ready-fire-aim" sequence and to overcome the hubris of analysis. A second, though admittedly weak, finding of the study is consistent with this argument. High analytical orientation leads to scanning that is domain-constrained and focussed. Such scanning, it can be argued, is incapable of finding bold new opportunities. In an era of environmental unpredictability and discontinuity, there may be a valid argument for deemphasizing analysis and linear thinking so as to promote the members' sensitivity to the broader environment and to enhance their ability to innovate. A firm's opportunities and threats increasingly arise from outside its task environment - particularly in the high technology industries where innovations in one industry can revolutionize another with which, till that time, it had

little in common. In such an era, a healthy dose of unconstrained scanning is essential for proactive or even reactive coping. Analysis is useful when there is a causal model that connects events to their effects. In the face of possible discontinuity, the causal links may be too complex to interpret analytically, and intuition and gestalt rather than logic and analysis may be the preferred learning tools under such circumstances. The first signs of an opportunity or of a threat is often a gut-feel that cannot be justified with analytical precision. If such gut-feel is not felt to be acceptable within the company, managers will gradually stop looking beyond the immediate task domain.

Managers with greater experience with diversity are less constrained in their scanning. More entrepreneurial the personal orientation of managers, the more unconstrained is their scanning. These are the other two weak but expected findings. Both have interesting implications for the training and staffing functions. Driver and Streufert (1969) had suggested that organizational placement of managers should match their cognitive complexities with the requirements of their jobs. Certain functions in companies may require managers who are sensitive to the broad environment ; strategic planning or new venture development are possible examples. Even among the more traditional functions, marketing may need a greater awareness of the broader environmental trends compared to accounting. An organization can benefit by systematically placing more entrepreneurial managers and those with greater exposure to diversity in such functions.

Similarly, internal training and development programs may be tailored so as to expose managers in such functions to greater diversity by rotating them in

different assignments in different locations. These suggestions are not new and companies have been following them traditionally. It is comforting, however, that in these implications, the findings are not counter-intuitive.

All these are expected results and they confirm past theoretical suggestions and empirical observations. What may be more interesting to review are the two surprises in the model. First, as environmental heterogeneity increases, scanning, instead of being more diverse as hypothesized, becomes more restricted and domain-bound. Second, as the task is perceived to be less and less structured, scanning becomes less diverse and more focussed on the narrower task environment. The path diagram confirms that the effect of environmental heterogeneity is also mediated through the perception of task structure. In effect, therefore, the surprise is really one : why does the perception of the task being unstructured lead to more constrained rather than less constrained scanning ?

Schroder et al (1968) have demonstrated the existence of an inverted U-shaped relationship between environmental complexity and integrative complexity of individual's cognitive maps. Lawrence and Dyer (1984) have built on this finding to suggest that beyond a level of information complexity, innovation and learning are hampered due to limitations in human information processing capacity. Similarly, it can be argued that beyond a level of task complexity, "information avoidance" behavior becomes predominant as a means to reduce cognitive overload. Beyond this point, search becomes simple-minded problemistic search - "... in the neighborhood of problem symptoms and ... in the neighborhood of current alternatives" (Cyert and March, 1963, p121). In this

range, we can indeed expect to see decreasing scanning diversity with increasingly unstructured tasks. All survey respondents occupied managerial positions and perhaps faced relatively unstructured and judgemental tasks. Therefore, it is not impossible that the data pertains to this range.

Recent research by Ben-zur and Breznitz (1981) and Streufert, streufert and Denson (1983) also suggests that stress in the decision situation reduces the dimensionality of decision behavior. It does not affect the extent of risk-taking but leads to to a more unidimensional focus on one action domain. Extending this argument, it is not implausible that when tasks become too complex, decision makers narrow rather than extend their scanning focus.

Reviewing the literature on human performance in information search tasks, Connolly and Serre (1983) have noted that "... human skills in balancing the costs and benefits of information acquisition may be seriously deficient, even in a laboratory task in which the balance is made highly salient and extended opportunities of learning are provided. If these findings generalize to the real world information acquisition tasks noted earlier, they imply significant non-optimalties may be found in such tasks" (p3).

It has also been suggested that perceived cue validity affects information acquisition behavior. Low validity cues may not yield enough reduction in decision error to justify acquisition of such information (Connolly and Gilani, 1982). Edwards (1965) has suggested this relationship normatively, based on the Bayesian model of decision behavior. Snapper and Peterson (1971) have confirmed the suggestion in their laboratory experiments which show that subjects information behavior depart

substantially from optimum : subjects overacquire information when diagnosticity is low, underacquire at intermediate levels of diagnosticity, and acquire information optimally only for highly diagnostic information. Conolly and Serre (1983) have extended the finding to show that the pattern of overacquisition of information for low-consequence decisions and under-acquisition of information for high-consequence decisions is robust to variations in overall cue validity. Further, they have also shown that such sub-optimal information acquisition behavior persists with feedback and learning is often limited.

The pattern of these findings is not inconsistent with the following scenario : managers face a high degree of cognitive stress when they perceive their tasks to be highly unstructured. This leads to an unidimensional focus in their information acquisition behavior. Given the ambiguity and equivocality in information that accompany unstructured tasks, information from the broader environment have even lesser cue validity than information from the more interpretable immediate task environment. Therefore the unidimensional focus is directed toward that domain. Hence the finding that more unstructured the task, more domain-constrained the manager's scanning behavior.

Another explanation for the finding may lie in the notion of slack. Managers' carrying out structured tasks may have more slack to invest in scanning the broader environment. When tasks are highly unstructured, little slack may be available for any activity other than getting the immediate task done. The slack in question may not be physical slack in the sense of time or other tangible resources but intellectual slack in the sense of cognitive capacity. Further, with structured tasks, most decisions can be taken through SOP's and the ones that need external

information may need information from beyond the task environment since implications arising from the task environment are consistent and standard and are included in the SOP's. Thus, the scanning needs for structured tasks may be biased toward the broader environment precisely because the task is structured and the immediate environment is predictable and unambiguous and therefore does not need to be constantly monitored.

APPENDIX

SAMPLE

In June, 1984, the largest 25 firms in The Republic of Korea (South Korea) were approached for access to conduct personal interviews as well as questionnaire surveys to study the scanning practices of their managers. 16 firms agreed to participate in the study. Telephonic follow-up with those who refused access suggested that those firms perceived the research as an effort to find the specific sources and ways of their scanning and were not willing to part with what they considered to be highly confidential information.

In each company that accepted the request, a contact was established and met personally. Each company was given 10 questionnaires and was requested to distribute them internally, ensuring balanced representation of managers in different management levels and functions. This approach was adopted since the proposal of random selection of respondents from a list of company executives did not find favor with most of the participating firms.

A total of 111 filled and usable questionnaires were received. Given the sampling process whereby the firms distributed the questionnaires internally, no evaluation of non-response bias was possible.

A cross-tabulation of the respondents by function and management level is presented in table 3. While all 111 respondents reported their management level (24 top, 26 middle, 64 junior), only 97 indicated their functional affiliation.

	Junior managers	Senior/Middle managers	Top managers
<u>Functions</u>			
Marketing	17	12	3
Finance/Accounts	4	2	1
Planning	21	3	6
Research/Design	5	2	2
MIS	1		
General Management	2	6	6
Others	3		1
Total	<hr/> 53	<hr/> 25	<hr/> 19

Table 3 : Distribution of respondents by level and function

MEASUREMENT

1. Scanning Behavior

As indicated in section 2, scanning behavior was operationalized as a composite measure consisting of two dimensions : the kinds of information acquired by the respondents, and the sources used for acquiring them (see Figure 1).

Following Aguilar (1967), Keegan (1967), and Coolings (1968), environmental information was categorized into seven factors, viz., competitive, market, technology, regulatory, resource, broad issues, and others. The percentage of total scanning time spent by respondents on each factor was measured directly. Similarly, sources were

categorized as customers, suppliers, bankers, advertising agents, agents and distributors, consultants, general publications, trade publications, trade shows, and others, and the respondents were asked to estimate the percentage of external information they acquired from each of these sources.

Market, competition and technology were considered as information factors relevant to the immediate task environment, while regulatory, resource, broad issues and others were considered as factors that were part of the residual "broad environment". Customers, suppliers and agents and distributors were considered as members of the firm's task-domain, and the other sources were considered as representing outside-domain actors.

Total scores of each respondent for percentage of time spent acquiring market, competitive, and technological information and percentage of information gathered through customers, suppliers and agents and distributors were added and the sum was used as a measure of the extent of domain-focus in the respondent's scanning behavior.

2. Environmental Characteristics

The rationale for including environmental characteristics as variables of interest was the hypothesis that the nature of the environment influences the kinds of information that are perceived by managers as necessary for effective decision making. Following the arguments of Dill (1962), Starbuck (1976) and Weick (1969), it is the perception of the environment rather than any "objective reality" of its characteristics that drives the attention and interpretation processes collectively labelled as

scanning behavior. In this study, therefore, operationalization and measurement of the environment were based on managerial perceptions and not on any objective measures, quantitative or qualitative (see Downey and Ireland, 1979, for a detailed discussion on different measures of environmental characteristics).

Questions and scales developed by Miller and Friessen (1983) for measuring environmental attributes were directly adopted in the study instrument. However, while the theoretical construct proposed by the authors categorizes the environment along three dimensions - dynamism, hostility, and heterogeneity - factor analysis of the responses yielded only two distinct dimensions. Based on interpretation of the factor loadings (see Table 4), these dimensions were labelled as predictability (factor 1) and homogeneity (factor 2). Note that these empirically generated factors almost perfectly match the environmental categorization scheme proposed by Lawrence and Lorsch (1967).

	Factor 1	Factor 2
Predictability of competitors	0.75	
Predictability of customer needs	0.61	
Predictability of industry upswings and downswings	0.50	
Diversity in methods of production and marketing		0.56
Rate of new product and process innovation		0.42

Table 4 : Measurement of Environment Attributes:
Factor Loadings

3. Task Characteristics

Task characteristics were measured using the instrument developed by Daft and Macintosh (1981). However, here again, while the authors had conceptualized two dimensions of task - variety and analyzability - factor analysis of the responses yielded only one significant factor with an eigenvalue of 1.34 and which explained 27 percent of the variance. This extracted factor (loadings shown in Table 5) suggested a categorization of tasks along a single structured- unstructured dimension. Here again, the extracted dimension closely follows Perrow's proposal (1967) of categorizing tasks as routine-nonroutine.

	Factor 1
1. Tasks require a lot of experience and training	0.83
2. Tasks require extensive and demanding search for solutions	0.55
3. Available information can be interpreted in several ways and can lead to different but acceptable decisions	0.43

Table 5 : Task characteristics : extracted factor

4. Analytical Orientation

Analytical orientation was one of the two dimensions of a broader variable - strategic orientation - that was developed and used in the study. The variable was measured using questions and scales developed by Miller and Friessen (1983).

The questions and the results of factor analysis of responses are shown in Table 6 (the factors explained 41 percent of the variance). The first factor was used as an indicator of analytical orientation. The second factor was found not to have any significant effect on the aspect of scanning behavior reported in this paper and was not included in the model.

	Factor 1	Factor 2
1. Futurity of analysis	0.60	
2. Top management involvement in analysis	0.41	
3. Industry and competitive analysis	0.76	
4. Use of analytical techniques	0.64	
5. Extent of risk taking		0.57
6. Aggressiveness in competition		0.66
7. Product/process/service innovation	0.50	

Table 6 : Strategic orientation - underlying factors

5. Entrepreneurial Orientation

Entrepreneurial orientation of the individual was measured through the concepts and indicators proposed by Stevenson (1983). The framework proposed by him consists of five dimensions for differentiating between entrepreneurial and trustee-ship orientation of managers. These dimensions are strategic drive, commitment to opportunity, commitment of resources, control of resources, and preferred management structure.

All the questions proposed by Stevenson were administered using five-point ordinal scales. However, only two of the questions, those measuring respondents' attitudes toward commitment and control of resources, showed strong discriminating power. The other questions were inter-correlated and did not pass the tests of construct validity. Hence, the respondents' scores on the two dimensions of commitment and control of resources were added to form a scale that was used as an indicator of their entrepreneurial orientation. The scale had poor but marginally acceptable reliability (Cronbach's alpha of 0.47).

6. Experience with Diversity

Experience with diversity was operationalized as a sum of two indicators - number of languages read, and number of countries lived in. The resulting scale was found to have high reliability (alpha 0.76).

7. Management Level

Management level was measured by assigning each respondent to one of three categories - top, middle, and junior - based on their designations. Executive Vice Presidents, Managing Directors, and Executive Directors were classified as top managers, Directors and General Managers as middle managers, and Managers and Assistant Managers as junior managers.

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